EZ430-C9

Getting Started with Kionix EZ430-C9 Evaluation Board for the Texas Instruments MSP430 USB Stick Development Tool

TEXAS INSTRUMENTS
MSP430
Developer Network

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Contents

1. Kionix EZ430-C9 Evaluation board
2. CD containing sample firmware for reading acceleration
3. Application Note AN053 (this document)

Overview

The Texas Instruments (TI) eZ430-F2013 development kit with the Kionix KXTC9 Evaluation Board (EZ430-C9) provides a simple environment to quickly start sampling X, Y, and Z accelerations and create accelerometer applications using the MSP430F2012 in a convenient USB form factor.

Hardware

Development Kit Components

Texas Instrument eZ430-F2013 (not included)

TI's eZ430 Development Tool consists of a MSP-EZ430U Debugging Interface, which connects to a detachable eZ430-T2012 target board all housed inside a plastic enclosure. The enclosure can be opened to attach/detach different target boards. It is to the eZ430-T2012 target board that the Kionix accelerometer evaluation board can be attached.

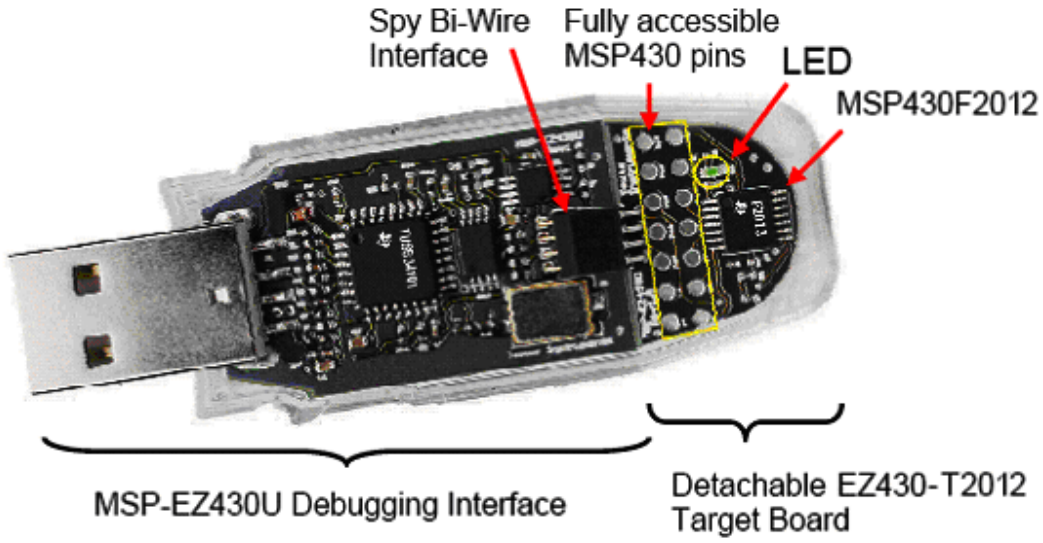


Figure 1: eZ430-F2013 Development Tool

The MSP-EZ430U debugging interface may come with Spy Bi-Wire Interfaces supplied through either a 4-pin connector (Figure 2) or a 6-pin connector (Figure 3).

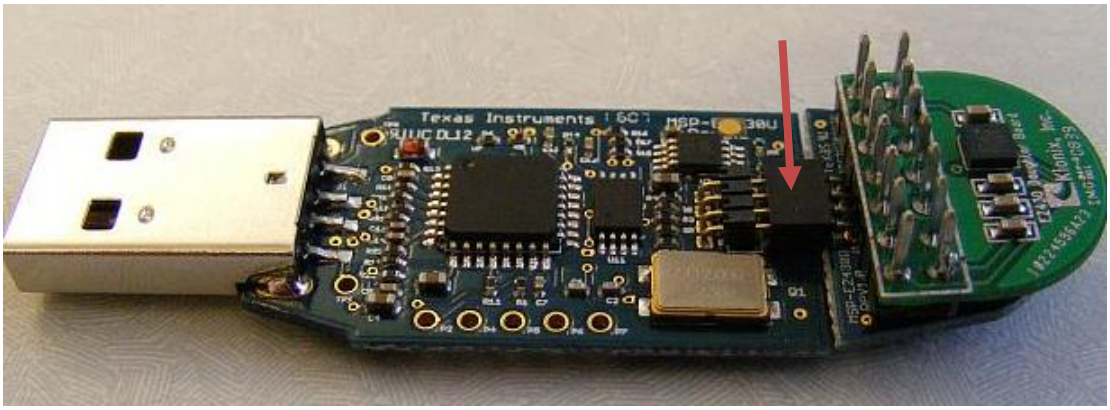


Figure 2: eZ430-F2013 development kit with 4-pin target board connector

Figure 3: eZ430-F2013 development kit with 4-pin target board connector

Since the detachable eZ430-T2012 target board comes with a 4-pin connector, it should be placed on the middle 4-pins of the eZ430-F2013 development kit if it comes with 6-pin connector.

The eZ430 Development Tool provides a real-time debugging and programming interface for the MSP430F2012 on the target board, and comes with the easy-to-use IAR Embedded Workbench Integrated Development Environment (IDE). The T2012 can be used to develop your personal project or to evaluate the MSP430 MCU. The latest product information and ordering information about the ez430 Development Tool can be found at: http://www.ti.com/tool/ez430-f2013. The latest product information and ordering information about the eZ430-T2012 target board can be found at: http://www.ti.com/tool/ez430-t2012.

Kionix EZ430-C9 Evaluation Board

The Kionix EZ430-C9 Evaluation Board provides the connection between the KXTC9-2050 accelerometer and the MCU. The two boards (Kionix EZ430-C9 and the TI eZ430-T2012 target board) connect to each other through the 14-pin configuration (Figure 4). The pin configuration of both boards are compatible with each other, meaning pin 1 through pin 14 of the eZ430-T2012 connect to pin 1 through pin 14 of the EZ430-C9 respectively.

Figure 4: Kionix EZ430-7 Evaluation Board Mounted on TI eZ430-T2012

Power to the EZ430-C9 is provided through the target board. If the target board along with the EZ430-C9 is to function as a standalone unit, then an external power supply can be connected appropriately to the 14-pin connection.

PCB board schematic is shown in Figure 5, and board layout, pin description, and accelerometer axis orientation are shown in Figure 6.

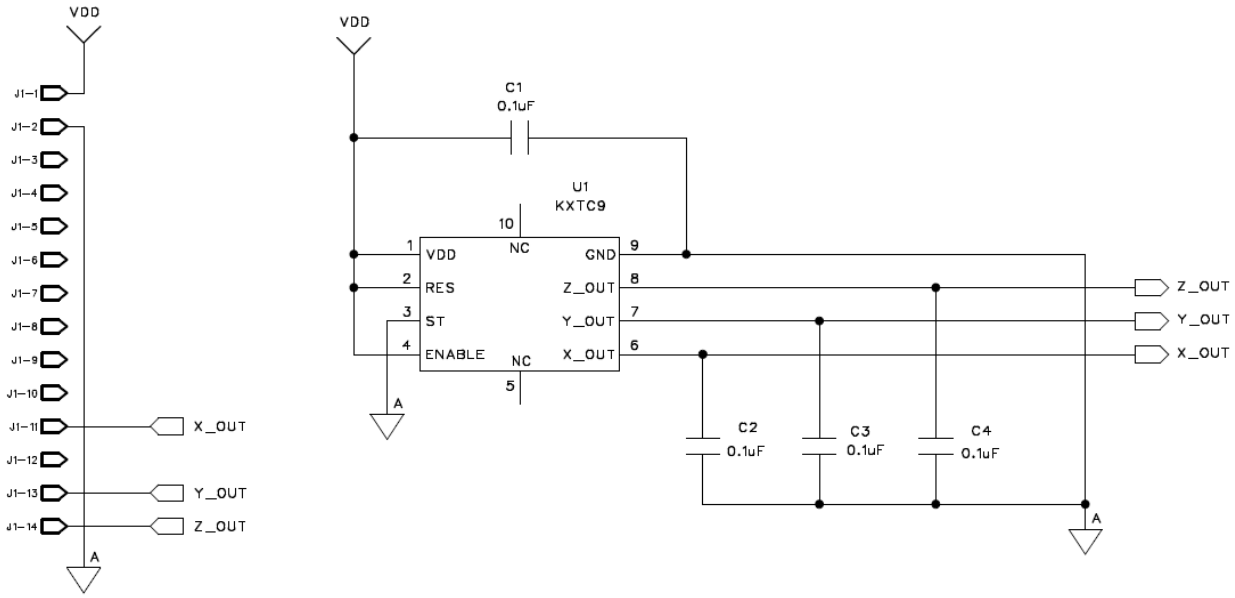
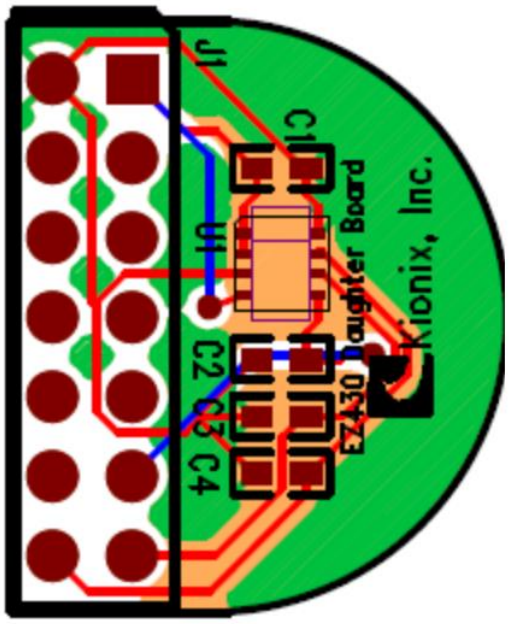
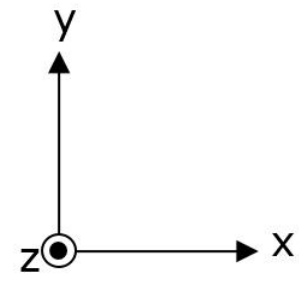


Figure 5: Schematic for EZ430-C9 Evaluation Board





Orientation of accelerometer axes

J1 Connector Pin Description	
pin 1	**VDD**
pin 2	**GND**
pin 3	P2
pin 4	P13
pin 5	P3
pin 6	P12
pin 7	P4
pin 8	P11
pin 9	P5
pin 10	P10
pin 11	**X**
pin 12	P9
pin 13	**Y**
pin 14	**Z**

Outer Dimensions: 1.9cm x 1.6cm

Figure 6: PCB Layout, Part Orientation, and J1 Connector Pin Description

The product specifications for the KXTC9-2050 accelerometer can be found at: http://www.kionix.com/product/KXTC9-2050

Software

Getting Started

Install the IAR Workbench. The IDE can be obtained from TI's website. http://www.ti.com/tool/iar-kickstart. More information about the IDE is available on the website as well.

Reading Acceleration Data Demo

A sample C file has been provided to help you get started in reading X, Y, and Z acceleration data. You will need to set up a project for the eZ430-T2012, and download the application onto the MSP430F2012. The following steps will guide you through the process:

1. Start the Workbench. (Start -> All Programs -> IAR Systems -> IAR Embedded Workbench for MSP430 6.30 -> IAR Embedded Workbench).

2. Click on the File tab -> Open Workspace ->. Select the directory where you have unzipped the 'AccelDemoKXTC9.zip'.

3. Select the 'KXTC9_F2012.eww' workspace.

4. Set the correct device by clicking on Projects -> Options -> General Options – select 'Target' tab and select MSP430F2012 from the list (Figure 4).

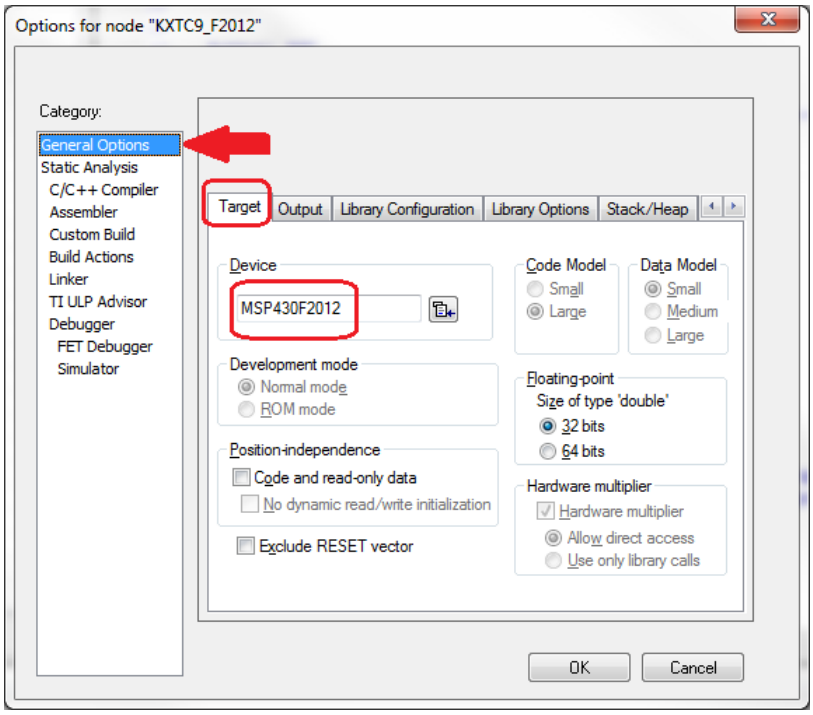


Figure 7: Select MSP430F2012 Device

5. Still in the Options window, select 'Debugger' category, select 'Setup' tab, and choose FET Debugger under **Driver** window (**Figure 8**).

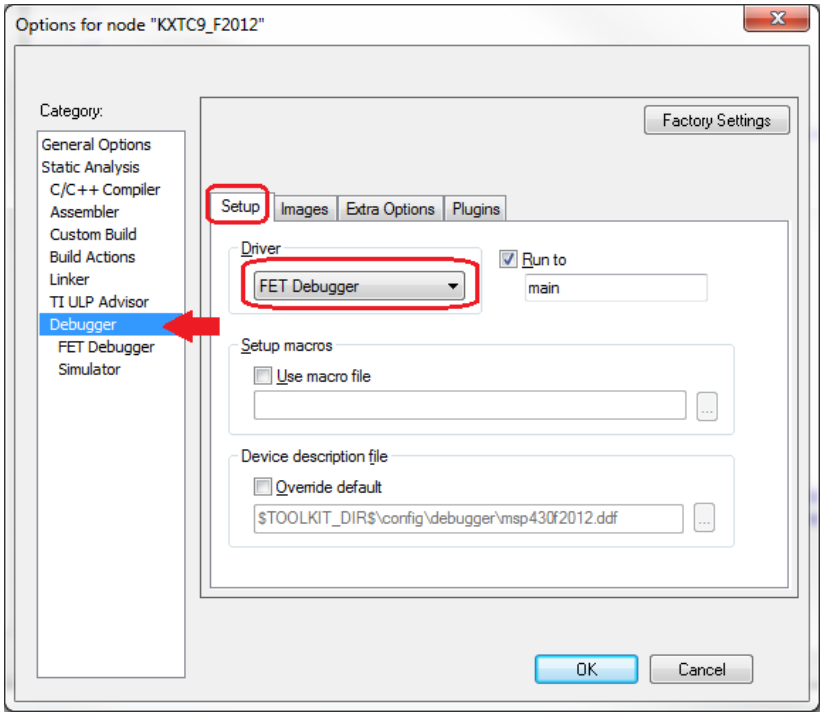


Figure 8: Select FET Debugger

6. Still in the Options window, under 'Debugger' category, select 'FET Debugger' sub-category, select 'Setup' tab, and choose 'Texas Instrument USB-IF' in the 'Connection' window to use the USB interface (**Figure 9**).

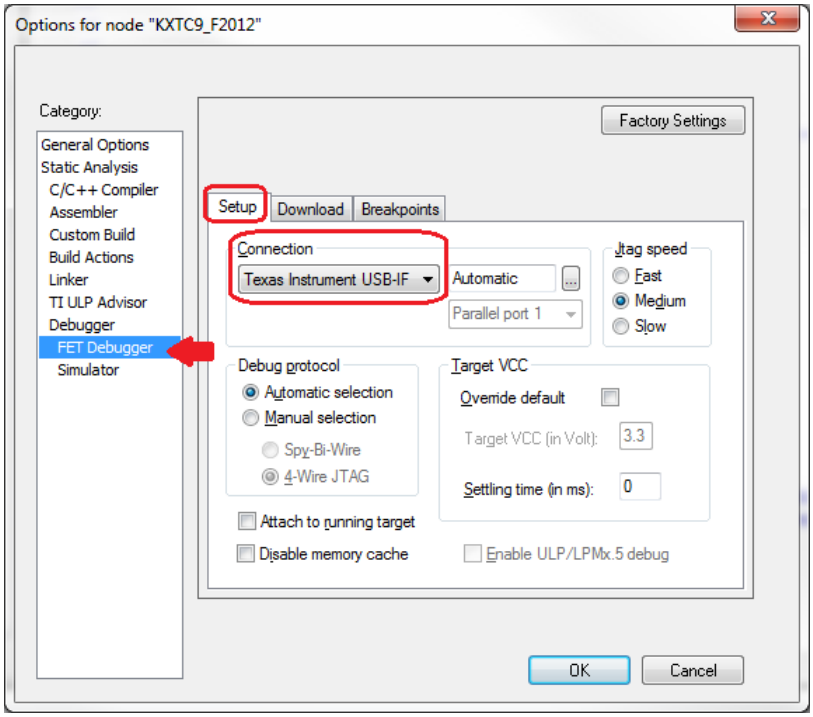


Figure 9: Select Texas Instrument USB-IF Connection Type

7. Use Project -> Rebuild All to build and link the source code. You can view the source code by double clicking on the project, and then double-clicking on the displayed source file.

8. Use Project -> Download and Debug to start the C-SPY debugger. C-SPY will erase the device Flash, and then download the application object file to the device Flash.

9. Place the cursor on the Zout variable. Press Run to cursor button to refresh the view of the Xout, Yout, and Zout (X, Y, and Z acceleration) variables in the watch window (Figure 10).

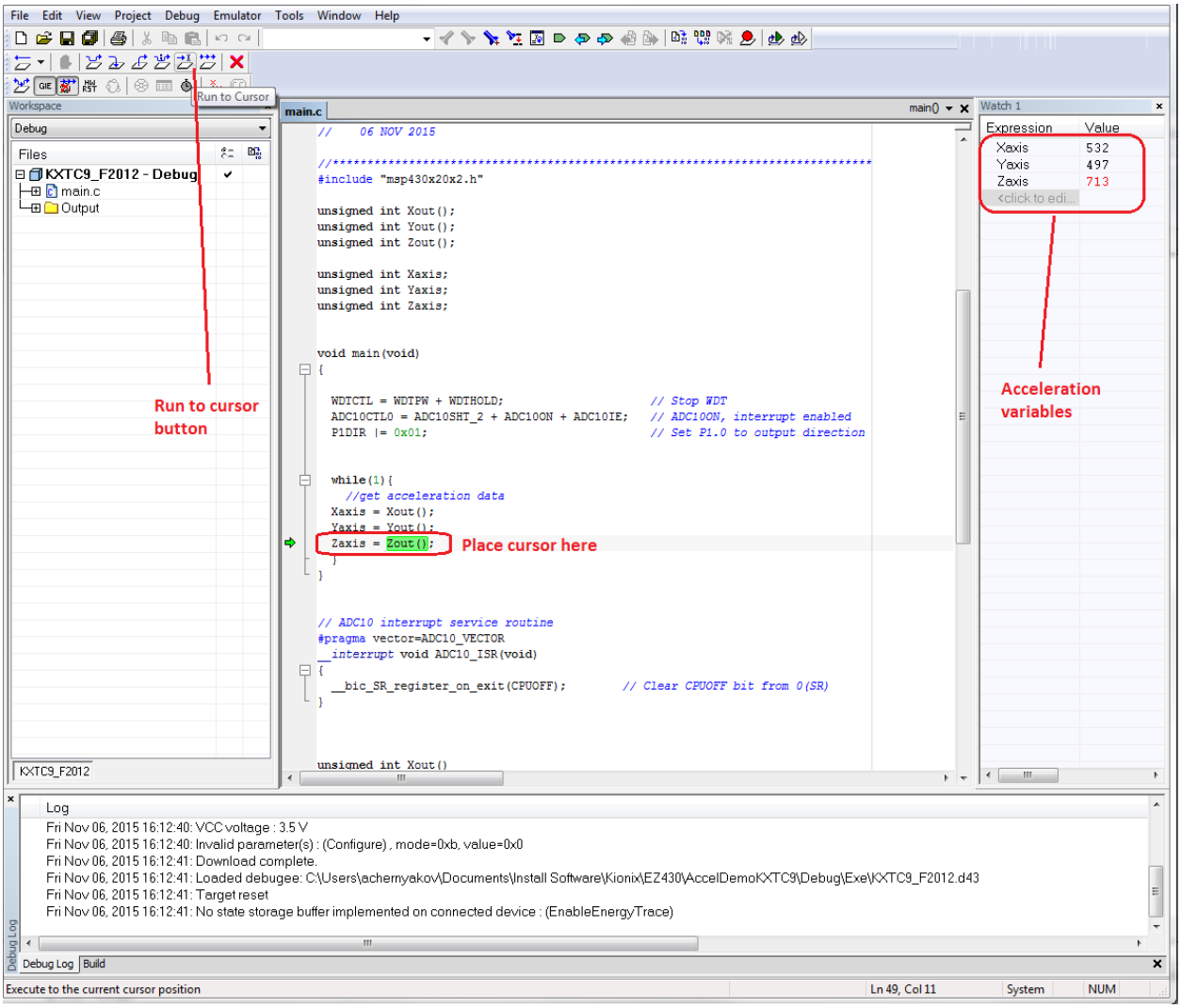


Figure 10: Operation in Debug Mode

Congratulations, you have successfully built and tested the AccelDemoKXTC9 application

Technical Support

If you experience technical difficulties with the EZ430-C9 evaluation board, please contact your local Kionix Sales Office for technical support information.

The Kionix Advantage

Kionix technology provides for X, Y, and Z-axis sensing on a single, silicon chip. One accelerometer can be used to enable a variety of simultaneous features including, but not limited to:

Hard Disk Drive protection
Vibration analysis
Tilt screen navigation
Sports modeling
Theft, man-down, accident alarm
Image stability, screen orientation & scrolling
Computer pointer
Navigation, mapping
Game playing
Automatic sleep mode

Theory of Operation

Kionix MEMS linear tri-axis accelerometers function on the principle of differential capacitance. Acceleration causes displacement of a silicon structure resulting in a change in capacitance. A signal-conditioning CMOS technology ASIC detects and transforms changes in capacitance into an analog output voltage, which is proportional to acceleration. These outputs can then be sent to a micro-controller for integration into various applications. For product summaries, specifications, and schematics, please refer to the Kionix MEMS accelerometer product catalog at: http://www.kionix.com/parametric/Accelerometers